

OPPORTUNITIES FOR INDUSTRIAL DEV. INVESTMENT

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Jidda, Saudi Arabia

June 25, 1953

OFFICIAL - INFORMAL
UNCLASSIFIED

Dear Mr. Olson:

I have read your letters of June 11 and 16 in regard to the Solar Heat Cooker with considerable interest. If the gadget really works there are few places where it would be more useful. Saudi Arabia has a great deal of sun and there is very little fuel available in most parts of the country.

I regret, however, for budgetary reasons we are unable to purchase one of the heaters but it will be considered as soon as our finances permit.

Sincerely,

John A. Dunaway
Acting U. S. Director of
Technical Cooperation in
Saudi Arabia

Mr. Walter O. Olson,
Acting Assistant Administrator, NEADS,
Technical Cooperation Administration,
Department of State,
Washington 25, D. C.

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Official
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Undersigned

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I regret, however, for budgetary reasons we are unable to purchase one of the heaters but ~~as soon as~~ ^{as} finances permit it will be ~~so~~ considered as soon as our finances permit.

Sincerely

JAD

25 June.

John:

It is definitely worth
trying out, especially in this
country where wood for fuel
is so scarce and sunshine
so plentiful.

Glen Brown.

7/16/53
TECHNICAL COOPERATION ADMINISTRATION
EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF THE DIRECTOR FOR MUTUAL SECURITY
WASHINGTON 25, D. C.

June 16, 1953

Dear Mr. Dunaway:

This will supplement my memorandum of June 11, 1953 with which I transmitted a news item concerning the commercial production of a solar cooker.

The accompanying article "Solar Heat for Cooking" by M. L. Chai of the National Physical Laboratory of India is forwarded for your information because of the interest we have had in this general subject.

Sincerely yours,

Walter C. Olson
Acting Assistant Administrator
Near East and African Development Service

Enclosure:

As stated.

Mr. John A. Dunaway,
Acting Director of Technical Cooperation,
American Embassy,
Jidda, Saudi Arabia.

TECHNICAL COOPERATION ADMINISTRATION

EXECUTIVE OFFICE OF THE PRESIDENT

OFFICE OF THE DIRECTOR FOR MUTUAL SECURITY

WASHINGTON 25, D. C.

June 11, 1953

Dear Mr. Dunaway:

Attached for your information is a copy of an item from the Hindustan Times, New Delhi, India, May 4, 1953, concerning the placing in commercial production of a solar cooker.

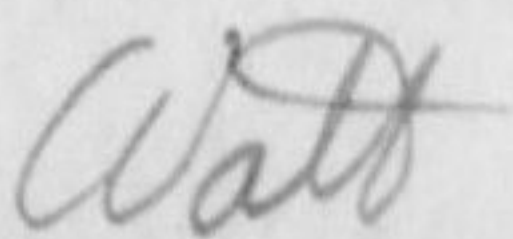
Our Industry and Commerce Division feels confident that this item may be of more than passing interest to some of the countries in the NEADS area. The thought has been advanced that the cooperative testing of the practicality of this solar cooker by a number of the countries might prove ultimately beneficial.

The American Embassy in New Delhi in a despatch commenting on the news item told the Minerals Attache that the Bombay firm which has been licensed to manufacture the solar cooker is Devidayal Metal Industries, Gupta Mills Estate, Bombay 10. The price of the cooker is Rs. 65, plus Rs. 15 for the box. The factory plans are now put at 1,000 cookers monthly, but will increase if the demand justifies it up to its capacity of 5,000.

It was reported that within the next three or four months a Calcutta firm was also likely to be licensed to manufacture the cooker.

Should you agree with the suggestion of testing this solar cooker, it is suggested that you either send an order to the company, enclosing remittance to cover Rupee cost and shipping charges, or if you prefer to use United States Treasury funds, request American Embassy to procure and ship and charge cost thereof to the appropriation allotment and obligation numbers you will furnish.

Sincerely yours,



Walter O. Olson

Acting Assistant Administrator
Near East and African Development Service

Enclosure:

From Hindustan Times.

Mr. John A. Dunaway,
Acting Director of Technical Cooperation,
American Embassy,
Jidda, Saudi Arabia.

HINDUSTAN TIMES,
NEW DELHI, INDIA
MAY 4, 1953

Solar Cookers Will Be On Sale Soon

BOMBAY, May 3.—India's first 400-watt solar energy cooker, designed by the National Physical Laboratory of India in New Delhi, will be made available in the market towards the end of this month, according to scientific sources here.

Production of solar energy cookers has already begun in Bombay.

Mr B. S. Pandher, a scientific officer of the National Physical Laboratory, is now here assisting the manufacturers in the design and lay-out of the cookers.

Meanwhile, performance tests are being carried out here with a test cooker. The tests include variations in temperature, humidity and wind velocity.

SUCCESSFUL RESULTS

Experts who have been conducting the tests here for the last 20 days claim to have achieved "successful results." They said under Bombay weather conditions, it took longer to cook rice and green vegetables than in Delhi. The experts attributed this longer duration to strong prevailing winds, smoke nuisance and high humidity. They said about 20 to 25 minutes were needed to prepare rice and vegetables in Bombay while a pound of water took 15 minutes to boil.

In Delhi, the experts said, 15 minutes were required to prepare rice and vegetables.

Solar cookers could be utilized on a sunny day from an hour after sunrise to an hour from sunset, they said. The ideal time for cooking would be at noon.

Tests of solar cookers for improved performance are in progress in the National Physical Laboratory at Delhi. The cookers have been mounted on a more efficient reflector which enables a much higher temperature to be obtained.—P.T.I.

OFFICE OF THE SCIENCE ADVISER U/SA

APR 23 53

Solar Heat for Cooking

M. L. GHAI

National Physical Laboratory of India, New Delhi

INDIA, like several other tropical countries, has abundant solar energy available almost throughout the year. The number of days with clear bright sunshine is large as compared to the dusty, foggy, cloudy or rainy days. The problem of heat storage is, therefore, not as critical as it is in countries where sunshine is occasional. This, combined with the hope of alleviating the general shortage of fuel in India, made it worth while to investigate the possibility of using solar heat for cooking food.

A survey of literature on the utilization of solar heat for cooking has been made, and methods offering the possibility of developing simple and inexpensive equipment for cooking with solar heat have been investigated.

Past attempts

Several attempts have been made in the last century to cook food with solar heat. The information available is, however, scanty and no attempt appears to have been made to assess the efficiency or the output of the devices designed for cooking food. The devices may be considered under two groups — first, those using direct absorption of solar heat, the "hot-box", with little or no concentration of solar rays; second, those in which the solar rays were first concentrated and then utilized for heating or cooking.

A hot-box consists of an insulated box blackened on the inside and covered with one or more glass sheets. Ordinary window glass acts as an excellent means of trapping solar heat. It transmits radiations of short wavelengths, which form the major part of the solar spectrum, and it is almost opaque to low temperature radiations emitted from within the box. The "one-way" action of

glass, therefore, traps the solar heat and the temperature of the box rises until a balance is reached between the heat received through the glass, and the heat lost by the exposed surface.

A typical hot-box is shown in Fig. 1. De Saussure¹ (1776) appears to have been the first to use the hot-box. His box consisted of an insulated, air-tight, wooden box, blackened on the inside, and covered with two layers of plane glass separated by an air space. He found that two glass sheets were necessary and that the use of more than two did not contribute to thermal absorption and was not economical. Langley² (1884) built a similar hot-box and carried it on an expedition to Mount Whitney. In spite of the snow and frozen ground, the box could be used for cooking at high altitudes. The additional heat losses from the box due to the low air temperature were counteracted by the increased intensity of solar radiation at high altitudes. John Herschel¹ (1837) made a small hot-box of mahogany and insulated it by burying in sand leaving only the top exposed. He was able to cook vegetables and stew meat. The maximum temperature that could be attained was 240°F. (115°C.).

The second method, that is concentration of solar rays, enables much higher temperatures to be obtained. In fact, if the rays could be concentrated in an ideal manner, it should be possible to attain temperatures as high as the temperature of the sun itself — i.e. about 6,000°C. The temperature ordinarily required for cooking, however, is only about 100°C., and for baking and frying, about 300°C.

Three different methods of concentrating solar heat have been employed making use of: (1) lenses, (2) plane mirrors arranged in a

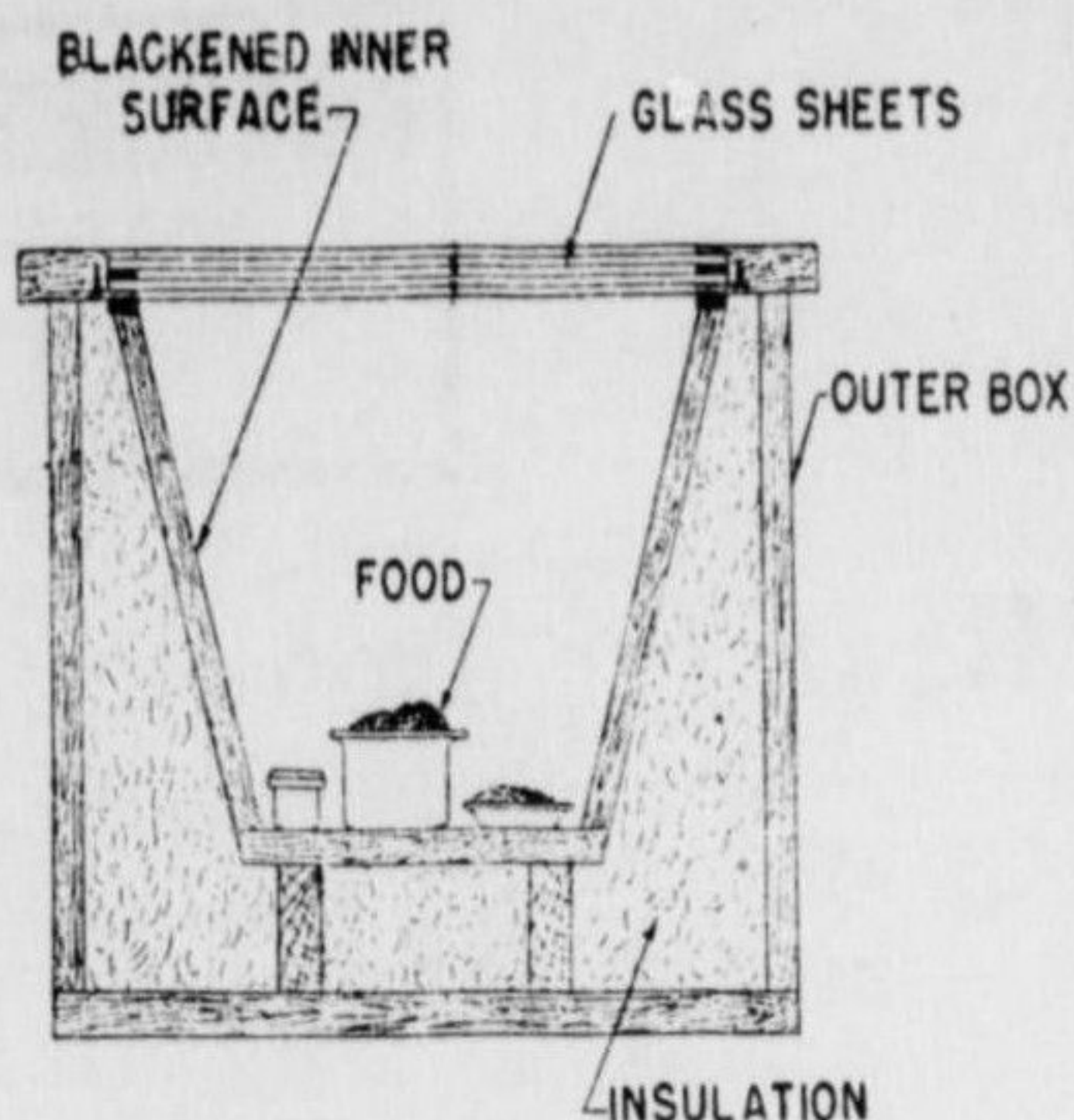


FIG. 1 — A TYPICAL HOT-BOX.

suitable manner, and (3) metallic reflectors. The concentration of solar heat by the "burning glass" is well known. Lavoisier used a hollow lens, 1.30 metres in diam., filled with alcohol and attained temperatures high enough to melt several metals, and fuse platinum ($1,773^{\circ}\text{C}.$). Mouchot (1869) tried cooking by concentrating solar heat directly on the food and noted that the surface gave "putrid fermentation" and "unbearable smell", whereas the inside remained uncooked. A suitable assembly of plane glass mirrors was used by Archimedes, who is reported to have used this arrangement to set fire to the Roman Fleet. Details of the arrangement are not known. Adams³ (1876) made a solar cooker using flat glass mirrors arranged in an 8-sided pyramidal structure, 2 ft. 4 in. in diam. at the larger end. The mirrors reflected the rays on a cylindrical cooking utensil enclosed in a glass jar. Adams claimed that vegetables as well as meat could be cooked by this arrangement.

Abbot⁴ (1939) constructed an indirect type of solar cooker in which the heat was absorbed first by a fluid and then conveyed to the cooking utensil. His cooker (FIG. 2) consisted of a 90 sq. ft. reflector of cylindrical-parabolic shape concentrating rays on a blackened metallic tube lying at the focus of the reflector. The tube contained a fluid which when heated moved by natural convection to a reservoir having built-in ovens for cooking. To reduce the surface heat losses, the metallic tube was surrounded by an evacuated double-walled glass tube. The reflector had an equatorial mounting allowing adjustment in the north-south direction to

counteract the seasonal motion of the sun, as well as in the east-west direction for the daily motion of the sun with respect to the earth. The reflector could thus be kept facing the sun for all positions. The reservoir containing the cooking ovens had to be located at a level higher than that of the reflector to allow the transmission of the heated fluid by natural convection without requiring any pump. From the available published literature, this type of cooker does not appear to have been widely used.

Storage of energy

The intermittent nature of sunshine requires that consideration be given to the storage of solar energy so that cooking could be done at any time. One method of storing solar energy would be to heat a fluid and store the heated fluid in a well-insulated container. To reduce the variation of temperature between the heating and the cooling cycle, chemical compounds having the desired melting points and high heats of fusion could be used. The high working temperature necessitates the use of efficient insulation and tends to make the method uneconomical. Storage in the form of chemical energy instead of heat energy is more desirable. A preliminary investigation was made to store energy by decomposing steam at high temperatures into hydrogen and oxygen, and storing the hydrogen. Two main difficulties were foreseen in such a method—firstly, the requirement of almost optically true reflectors for creating the temperatures high enough to

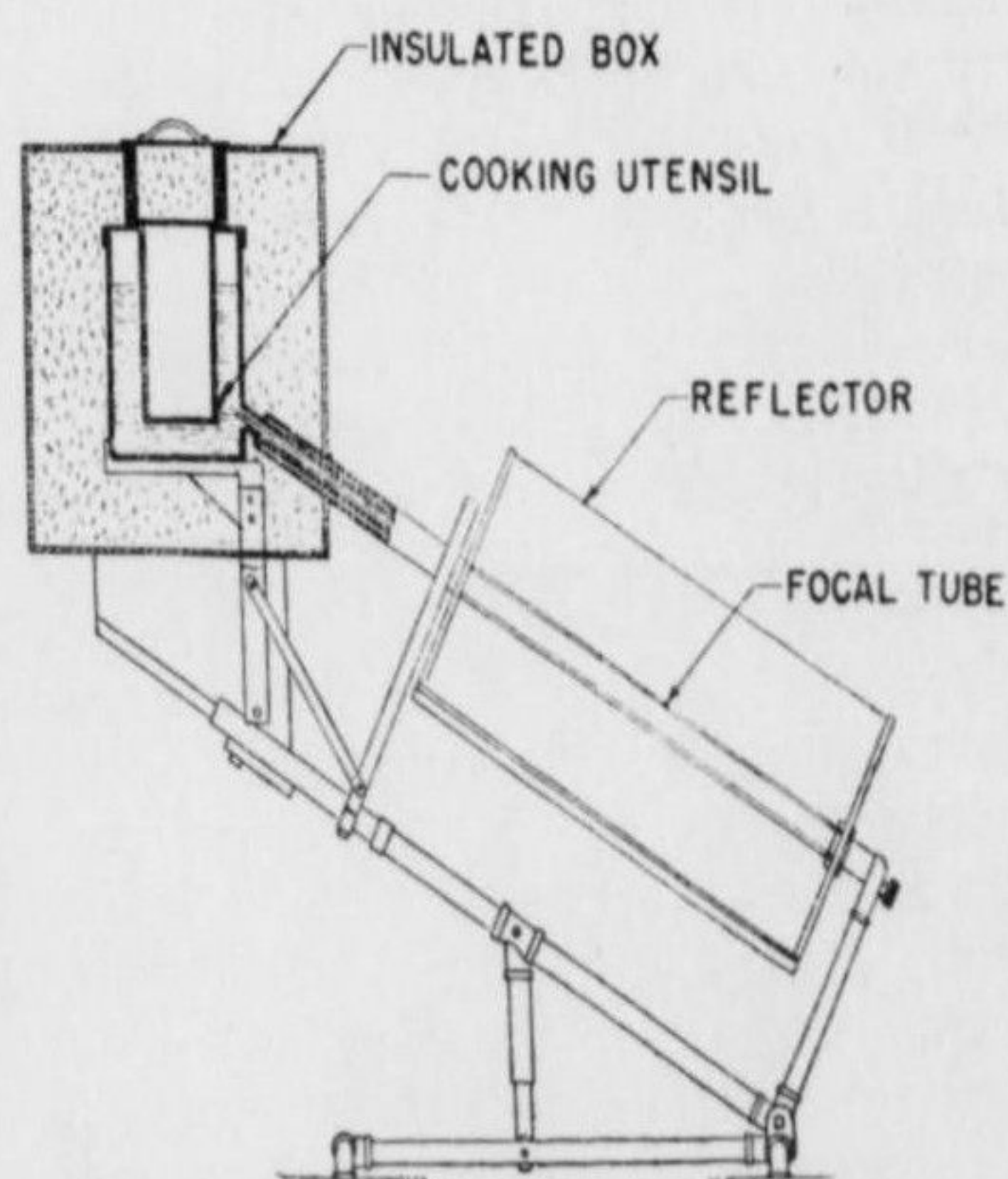


FIG. 2 — ABBOT'S SOLAR COOKER.

cause decomposition, and secondly, the problems connected with the storage and use of hydrogen in an average household.

In places with relatively few clear sunny days, provision of means for storage of energy is essential. However, in many parts of India and in other tropical countries with a large number of clear days, the storage of energy may not be so necessary. Cooking with solar heat may be economical even though it has to be restricted to the hours of sunshine. Further, it is important that the cost of the unit should be kept low enough to be within the means of the people, and that it should be simple and convenient to operate.

Metallic reflectors were preferred to glass lenses or mirrors, as they eliminated the disadvantages due to the fragility of glass. An indirect cooker which uses a heat absorbing fluid tends to have low efficiency, because the fluid has to be heated to high temperatures and heat losses are inevitable from exposed surfaces. A reflector concentrating the rays directly on the cooking utensil — referred to as direct reflector-type cooker in this paper — appeared promising as it could be made efficient, simple and cheap. The performance of a direct reflector-type solar cooker was studied in some detail and the results of this study are presented in this paper.

Due to the importance attached to the hot-box by previous experimenters, it was considered useful to estimate the performance of a hot-box as a device for cooking food. The hot-box has the advantage of remaining stationary; it is simple and convenient to operate.

Amount of solar radiation

Before estimating the performance of any particular device for utilizing solar heat, it is necessary to know the quantity of solar radiation which is available for utilization.

The intensity of solar radiation outside the earth's atmosphere is almost constant (solar constant). Its value, as determined by a number of investigators, is taken as 1.93 cal./sq. cm./min. or 427.2 B.t.u./sq. ft./hr. It may be mentioned that the rate at which a square foot of surface receives heat when held normally to the rays of the sun is approximately the same as the rate of dissipation of heat by an average adult under normal conditions of comfort.

Although the solar radiation received outside the earth's atmosphere remains constant, the radiation received on the earth's surface varies considerably and is much less than the solar constant. The reduction depends upon the nature and extent of the atmosphere through which the rays pass; dust, water and gas molecules in the upper atmosphere produce reflection and scattering, the absorption in this region being mostly due to ozone. In the lower atmosphere considerable absorption takes place due to water vapour, smoke, dust and gases. In the presence of thick clouds or dust-storms, almost all the radiation may be absorbed in the atmosphere. On clear days, the solar altitude is the main factor to be considered as this determines the air mass through which the rays pass before reaching the earth's surface. It is due to the difference in solar altitudes that the energy received at noon is more than the energy received in the mornings or in the evenings. Next in importance is the humidity. Experiments at Meadi⁴ indicated that the output of solar devices varied linearly with the relative humidity of the atmosphere. When the humidity was high, the depletion in solar energy was as much as 30 per cent. Quantitative studies of absorption due to dust, moisture and haze have been conducted by Maurain⁵ and a number of other workers. Also, the intensity of radiation on mountains and places of high altitudes is higher due to lower air mass and lower concentration of dust and smoke.

The average values for direct solar radiation on a clear summer day at about sea level (barometric pressure, 29.921 in.; depth of precipitable water, 0.787 in.; dust particles, 300 per cc.; partial pressure of ozone, 0.11 in.) have been estimated by Moon⁶. These values and the corresponding approximate values of sky radiation, as given in the *Guide Book of the American Society of Heating and Ventilating Engineers*, are shown in Fig. 3. These values have been used throughout the present paper.

The hot-box

In a hot-box, a part of the incident direct and sky radiation is transmitted through the glass top and absorbed by the inside surfaces of the box. Some of the absorbed heat is lost through the glass top and through the sides of the box, and the remaining is utilized for raising the temperature of the

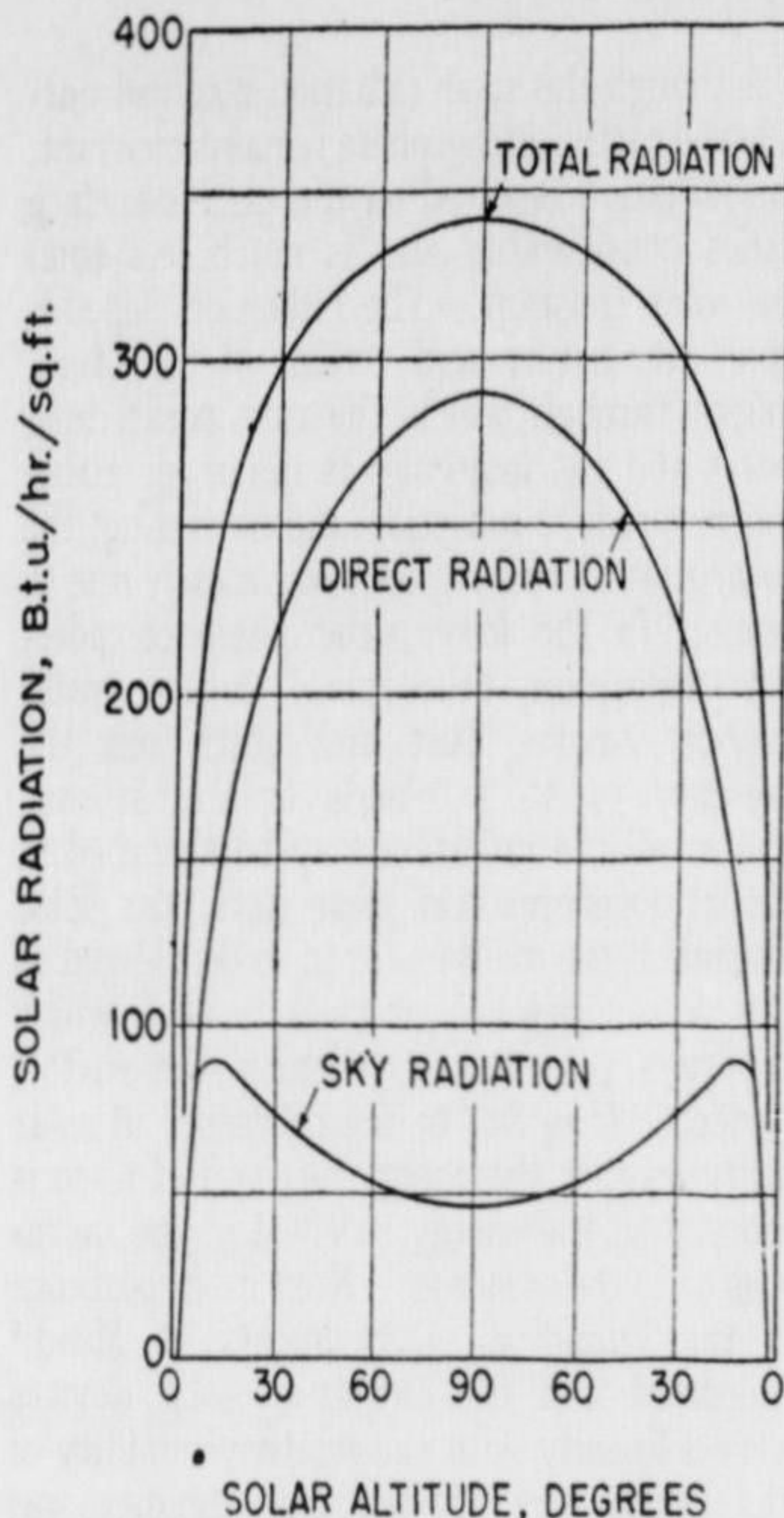


FIG. 3 — SOLAR RADIATION ON A NORMAL CLEAR DAY.

box and its contents. As the temperature of the box rises, the surface losses increase, until an equilibrium is reached between the heat absorbed, the heat lost through the sides of the box, and the heat utilized for cooking. The maximum temperature attainable inside a box is, therefore, determined to a large extent by the insulation of the box. A hot-box with a single glass sheet top, or with little or no insulation in the sides was found, by calculation, to be of little importance as it could not reach the boiling temperature of water (212°F.) with normal solar radiation. Hot-boxes with two glass sheets can reach the boiling temperature more easily and can, therefore, be used for cooking; the analysis and results for such hot-boxes have been presented below.

The effect of insulating a hot-box with two glass sheets is shown in Fig. 4. Curves are given for the heat output available for cooking in hot-boxes with insulation equivalent to 5, 10 and 20 in. of wood of conductivity $1 \text{ B.t.u./hr./sq. ft./}^{\circ}\text{F./in.}$, and inside and outside temperatures of 212° and 72°F.

respectively. A hot-box with insulation equivalent to 5 in. of wood can be used for cooking when the solar altitude is more than about 65° , which limits the hours of operation especially during winter. The period of cooking and the amount of net heat available could be increased by adding more insulation, although the cost of the box would also increase thereby. Insulation equivalent to *c.* 10 in. of wood appeared to be near the optimum insulation, as reduction in heat loss with further increase of insulation was negligible. Even with 10 in. insulation, it is necessary to have a solar altitude exceeding 40° .

Another serious disadvantage is the small output or available heat in a hot-box of normal dimensions. The output of hot-boxes of varying sizes is shown in Fig. 5. Only hot-boxes with effective face areas of less than 3 sq. ft. have been considered, as larger boxes are cumbersome. On account of the small capacity, and the rather large heat inertia of the box itself, the rate of heating or cooking of food in a hot-box is small.

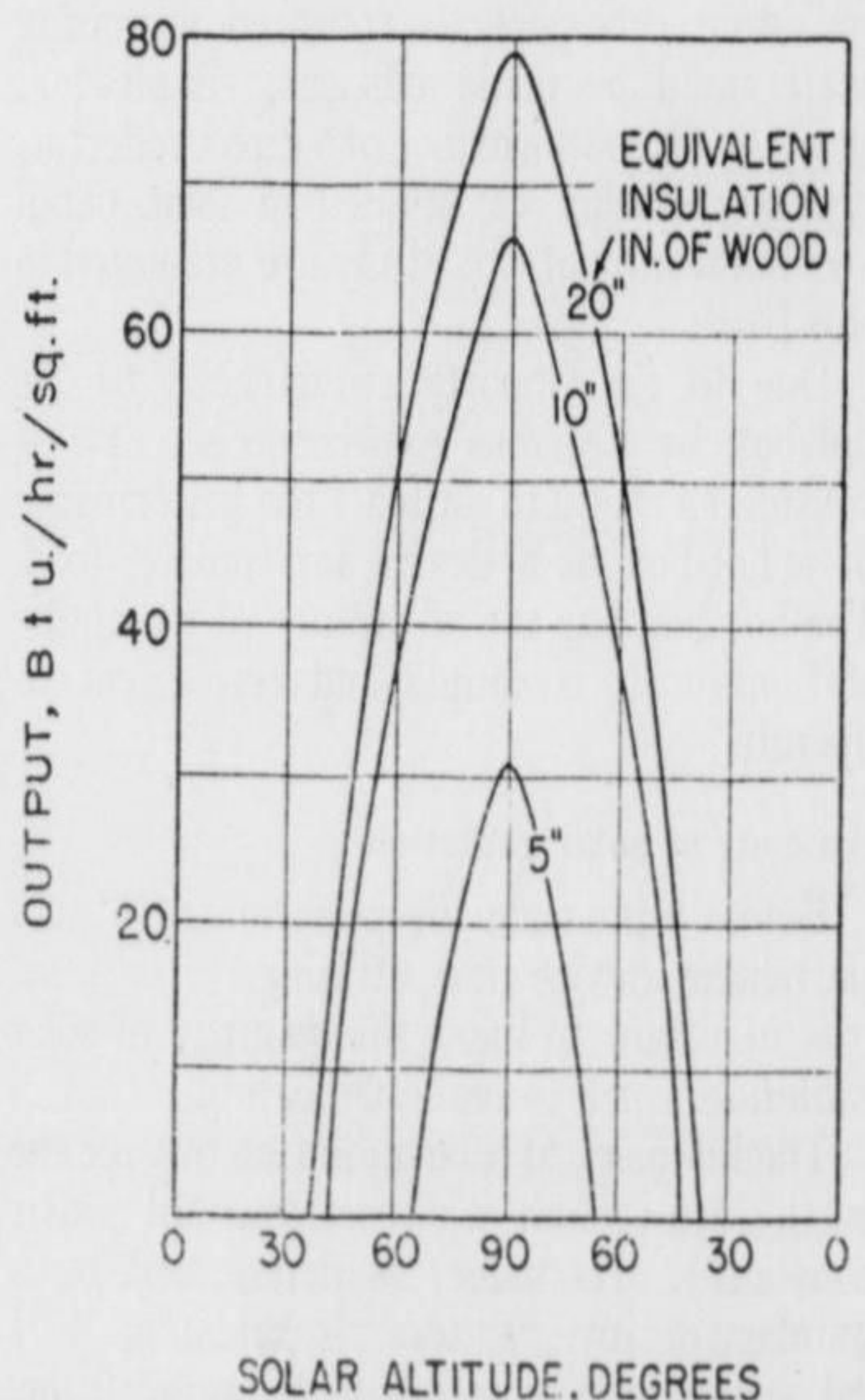


FIG. 4 — OUTPUT AVAILABLE FOR COOKING IN HORIZONTAL HOT-BOXES AT DIFFERENT SOLAR ALTITUDES OPERATING AT INSIDE TEMPERATURE OF 212°F. ON A NORMAL CLEAR DAY. THE SOLAR ALTITUDE CORRESPONDING TO ZERO OUTPUT INDICATES THE PERIOD OF OPERATION.

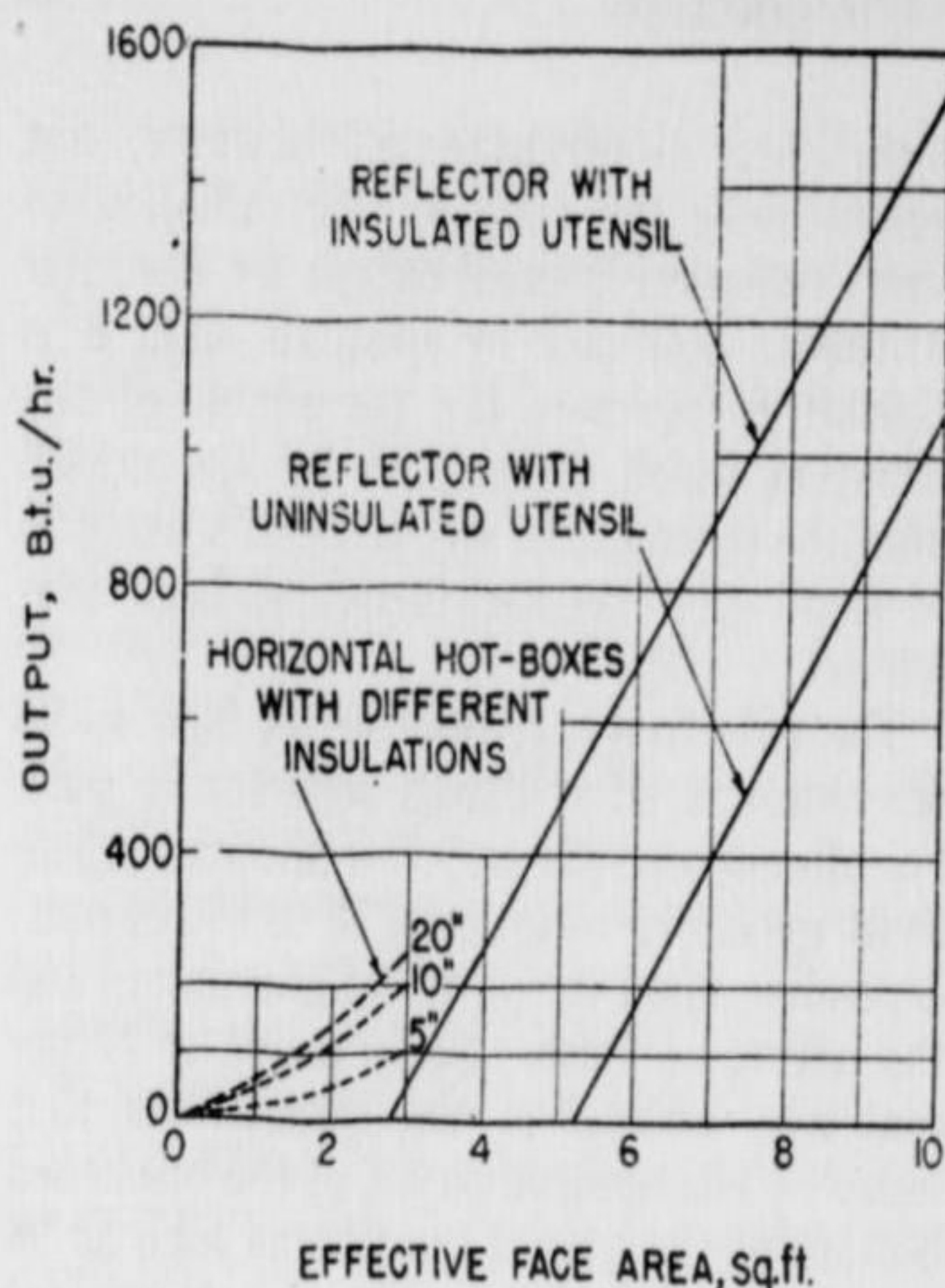


FIG. 5—OUTPUT AVAILABLE FOR COOKING *vs.* EFFECTIVE FACE AREA FOR DIRECT REFLECTOR-TYPE COOKERS AND HOT-BOXES.

The output available for cooking food and further raising the temperature inside the box, represented by q_o , was calculated by the heat balance equation

$$q_o = q_A - q_G - q_L$$

where q_A , q_G , and q_L are the rates of heat absorbed, heat lost through the glass top, and heat lost through sides respectively. The rate of heat transmitted through the glass sheets and absorbed inside the box was calculated by the equation

$$q_A = A_b(I_d \cos \theta \cdot \tau \cdot \alpha + I_s \tau_s \alpha) + A_f(I_d \cos \theta \cdot \tau \cdot \alpha_f + I_s \tau_s \alpha_f)$$

where I_d and I_s are the intensities of direct and sky radiation respectively, and τ and τ_s are the corresponding transmissivities of glass sheets; α and α_f are the absorptivities of the blackened surface and the surface covered by food; θ is the angle of incidence of the direct rays on the box; and A_b and A_f are the blackened area and the area covered by food, both projected on a plane parallel to the glass sheets. Transmissivity of clear glass depends to some extent on its refractive index, thickness and composition, and to a large extent on the angle of incidence for angles greater than 40° - 50° . Transmissivity to normal radiation for a glass sheet of 2 mm. thickness was taken as 0.86 for a single glass sheet and 0.75 for two

glass sheets. For angles of incidence of 45° , 60° and 75° , the transmissivity for two glass sheets was taken as 0.72, 0.65 and 0.35 respectively. For diffused radiation, it is necessary to integrate the transmittance at different angles of incidence. However, since the directional characteristics of diffused radiation are not well known, it was considered satisfactory to assume transmittance for diffused radiation as 85 per cent of the transmittance for normal radiation. The absorptivity for most of the food articles has been reported⁷ to be nearly 0.75; this value has been used in the calculations, the value for blackened surface being taken as 0.97.

The calculation of heat loss through glass sheets, which takes place mostly by radiation and convection, is slightly more difficult. Using T_i , T_1 , T_2 , and T_a as absolute temperatures of air inside the box, the inner glass sheet, the outer glass sheet, and of the outside air respectively, the rate of heat loss through the glass sheets, q_G , was calculated from the following equations of heat flow:

$$\begin{aligned} q_G &= 0.2(T_i - T_1)^{5/4} + \frac{\epsilon}{\frac{1}{\alpha} + \frac{1}{\alpha_G} - 1} (T_i^4 - T_1^4) \\ &= 0.16(T_1 - T_2)^{5/4} + \frac{\epsilon}{\frac{1}{2} - 1} (T_1^4 - T_2^4) \\ &= (a + bV)(T_2 - T_a) + \alpha_G \epsilon (T_2^4 - T_a^4) \end{aligned}$$

The first expression on the right-hand side of the equations represents the heat flow due to convection and conduction, and the second expression represents that due to radiation. For the inner glass, the value suggested by Jakob⁸ for horizontal plates facing downward was used; for heat flow between the glass sheets, the values given by Fischenden and Saunders⁹ were employed; for the upper plate, the coefficient $(a + bV)$ has been given by McAdam¹⁰, V being the wind velocity and a and b , constants. Since glass is almost opaque to low temperature radiations and reflection is generally small, the long wave absorptivity for glass, α_G , was taken as 0.96. The long wave emissivity of the blackened surface inside the box and of food articles was taken as 0.97. It may be mentioned that the equations given here ignore the small temperature drop and heat absorption in glass plates.

Losses from the sides of the box, q_L , were calculated from the equation

$$q_L = UA(T_i - T_a)$$

where $(T_i - T_a)$ is the temperature difference between the inside and the outside of the box, U , the overall coefficient of heat transfer including the air-film coefficient on the outside, and A , the exposed area. The exposed area on the four sides and the bottom was taken as twice the area of the top glass. Due to the difficulty of defining the total inside area, not covered by cooking utensil, the inside film coefficient was ignored, i.e. the inside surface temperature was taken as the inside air temperature itself. The blackened part receiving the solar heat will actually have a higher surface temperature, but the shaded parts and the part under the cooking utensil will be at lower temperatures. The assumption of inside surface temperature as being equal to the inside air temperature was, therefore, probably more correct than the consideration of inside film coefficient.

Direct reflector-type solar cooker

The performance of a direct reflector-type solar cooker may be estimated from the heat balance equation

$$q_o = q_A - q_L$$

where q_A is the heat absorbed by the cooking utensil, q_L the heat lost by the utensil from the exposed surfaces, and q_o the output available for heating and cooking the food, raising the water vapour, and heating the utensil.

If the reflector is kept facing the sun, that is the incident rays are always normal to the face of the reflector, q_A may be calculated from the equation

$$q_A = I_d A_e r \alpha$$

where I_d is the direct solar radiation, r the specular reflectivity of the reflector, α the absorptivity of the utensil, and A_e the effective face area of the reflector. As some of the reflected rays are intercepted by the framework, it is necessary to use the effective face area from which the utensil actually receives the reflection and not the total face area of the reflector.

A reflector-type arrangement makes full use of only the direct radiation and not the sky radiation, whereas the hot-box utilizes

both. This disadvantage is, however, not serious since the ratio of sky radiation to direct radiation is small except for low solar altitudes. For lack of adequate data it is difficult to estimate the percentage of sky radiation which is received by the utensil from the reflector; in any case, it is likely to be small and has not, therefore, been considered.

The reflectivity, r , may be as high as 96 per cent if a silver-plated reflector is used. For aluminium reflectors, the specular reflectivity generally varies from 70 to 85 per cent, depending upon the purity of aluminium and the nature of finish. Reflectivity of 77 per cent was assumed in the calculations that follow. The absorptivity, α , of the blackened bottom of the utensil may be as high as 98 per cent; but under practical conditions with imperfect blackening it may be less. An absorptivity of 94 per cent was assumed in these calculations.

The performance of a typical direct reflector-type cooker at a solar altitude of 90° is shown in Fig. 6. A reflector of effective face area of 10 sq. ft. receives a total radiation of about 3,410 B.t.u./hr. or 1,000 watts, out of which 2,940 is the direct radiation, the

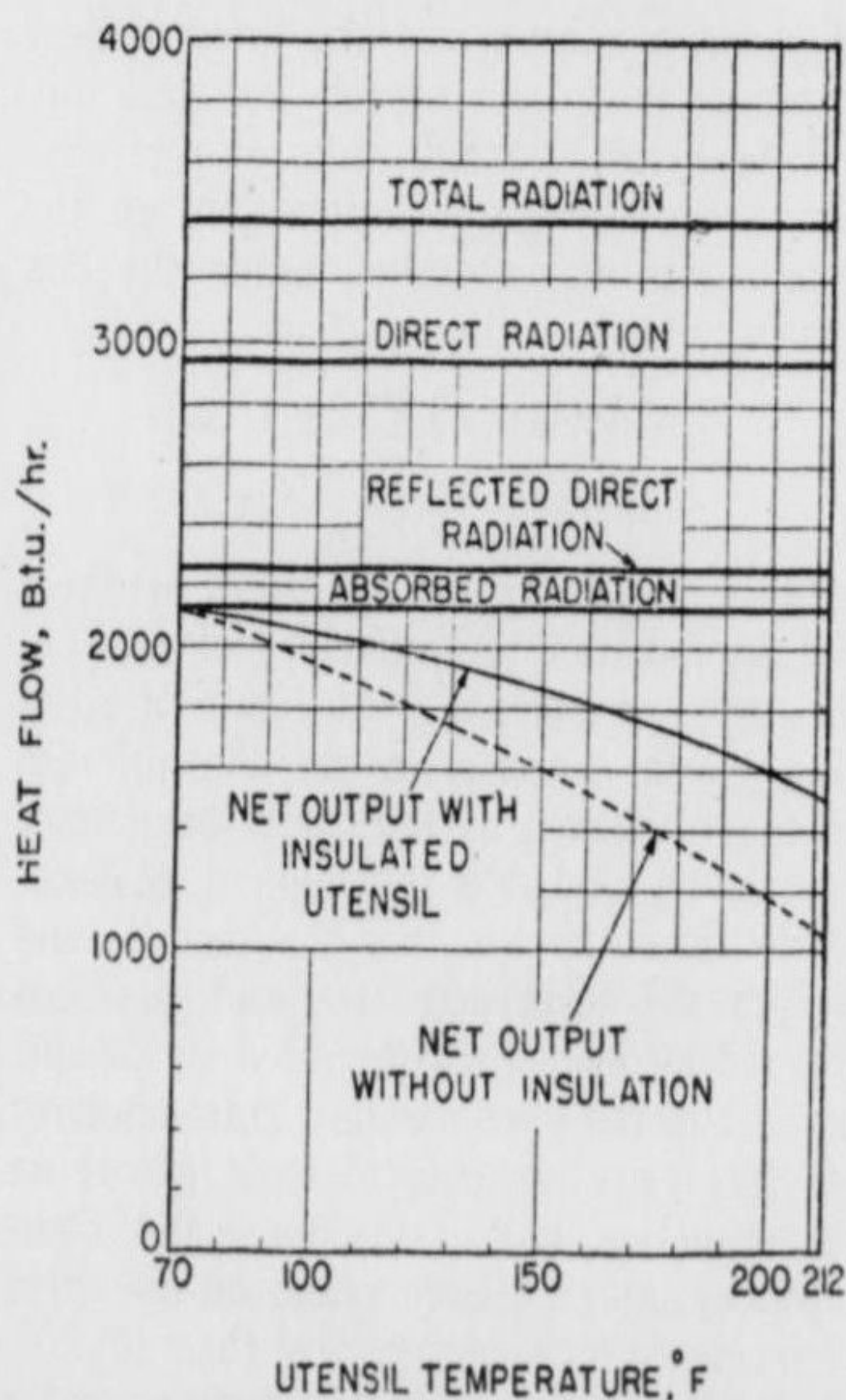


FIG. 6 — HEAT BALANCE OF A DIRECT REFLECTOR-TYPE COOKER, WITH REFLECTOR OF EFFECTIVE FACE AREA 10 SQ. FT., WORKING AT A SOLAR ALTITUDE OF 90° , ON A NORMAL CLEAR DAY.

rest being irregular sky radiation. The radiation actually received by the utensil, as calculated by the equation given above, is 2,234 B.t.u./hr. or 655 watts. At the start of cooking, all the energy is available for heating the food and the utensil, since q_L is then equal to zero; but, as the temperature of the utensil rises, the surface losses increase and the net amount of heat utilized for cooking the food is reduced by q_L . When the boiling temperature is reached, the temperature remains more or less constant.

The surface losses from the utensil depend upon the overall coefficient of the heat transfer, area of the exposed surfaces, and the temperatures of the utensil and its environment. The overall coefficient can be estimated with the help of the inside film coefficient, the thermal conductivity of the utensil material, and the outside air film coefficient. For single-walled, uninsulated utensils, the overall coefficient may ordinarily vary from about 1 B.t.u./hr./sq.ft./°F. on calm days to about 5 on windy days. Taking an average value of 3 and assuming the exposed area of the utensil to be 2 sq. ft., the surface losses have been calculated, and the net output, after deducting the surface losses, is shown in Fig. 6. The net output for such a utensil, when working at a temperature of 212°F., is 1,394 B.t.u./hr. or 409 watts. If the utensil is insulated so that the overall coefficient is reduced from 3 to 1, the net output at 212°F. increases to 1,954 B.t.u./hr. or 572 watts.

If the reflector is kept facing the sun, the reduction in performance at solar altitudes of less than 90° is not large except when the solar altitude is very small. The variation of output of an insulated utensil working at a temperature of 212°F. at different solar altitudes and for reflectors of different sizes is shown in Fig. 7. Comparing this with Fig. 4, it will be noticed that a reflector-type cooker can operate in a larger range of solar altitudes. The period of operation is, therefore, increased. In fact, a reflector with an effective area of only 6 sq. ft. gives boiling temperature when the solar altitude is as low as 10°.

Fig. 5 shows the estimated output of reflectors of different sizes, using insulated and uninsulated cooking utensils; it also gives a comparison of the output of hot-boxes of different sizes. A working temperature of 212°F. has been assumed for

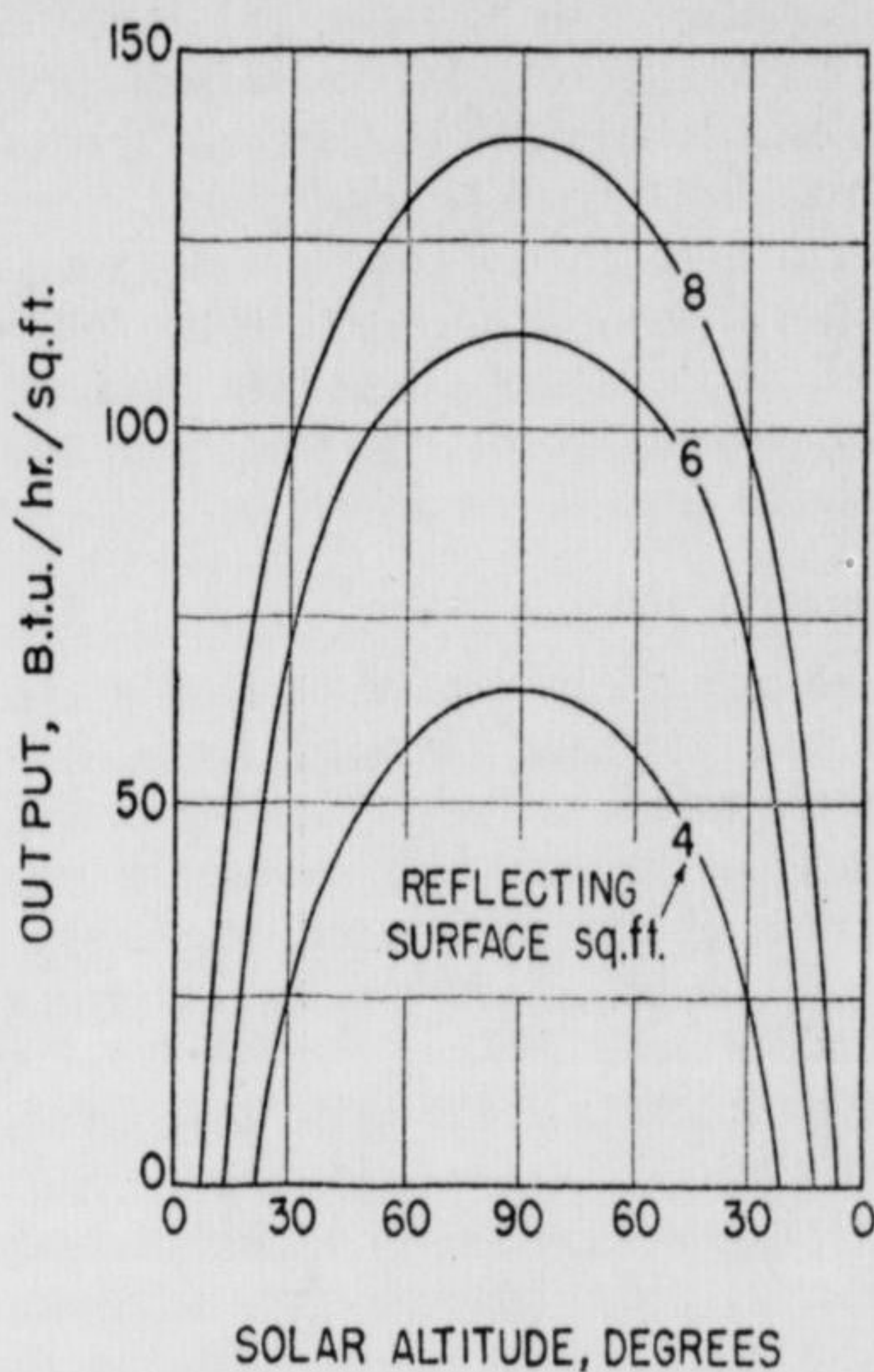


FIG. 7—OUTPUT OF DIRECT REFLECTOR-TYPE SOLAR COOKERS OF DIFFERENT SIZES AT DIFFERENT SOLAR ALTITUDES, OPERATING AN INSULATED COOKING UTENSIL AT 212°F., ON A NORMAL CLEAR DAY. THE SOLAR ALTITUDES CORRESPONDING TO ZERO OUTPUT INDICATE THE PERIOD OF OPERATION.

hot-boxes as well as reflectors. It is noted that as the reflector area is reduced the output decreases, until a limit is reached when the heat received is just sufficient to raise the temperature to the boiling point. This limit determines the minimum size of the reflector.

The reflector-type cooker appears to have three main advantages over the hot-box. Firstly, the range of solar altitudes and the corresponding period of operation are much larger. A reflector-type cooker can, therefore, be operated during the mornings and evenings also, whereas the hot-box can be used effectively only at noon. Secondly, the hot-boxes of convenient sizes have a small output. The output of reflectors of conveniently small sizes appears to be large enough to enable cooking for almost all sunny hours without requiring much time. Thirdly, more rapid cooking can be expected with reflectors not only because of their large outputs but also due to their low heat inertia, since there is no box to be heated. The first disadvantage of the hot-box can be eliminated to a large extent if it can be mounted on a support and kept

facing the sun at all times; but, then the chief advantage of the hot-box, i.e. simplicity, is lost. It may also be mentioned that as far as the efficiency of utilizing solar energy is concerned, the hot-box compares favourably with the reflector, especially due to the fact that the hot-box utilizes both direct and sky radiation whereas the reflector utilizes only the direct solar radiation.

Summary and conclusions

In countries having few sunny days it is necessary to have means for storing solar energy before its use for cooking can be made popular; but, for places with a large number of clear sunny hours, the development of a cooker which works only during sunshine has economic possibilities. For such a cooker to be economical and commercially practical, it is necessary that it should be inexpensive, simple to operate, and yet efficient. A direct reflector-type solar cooker, i.e. a reflector concentrating the rays directly on the cooking utensil, appears to meet these requirements.

Investigation shows that although the hot-box can be used as a device for keeping

cooked articles warm, its use for cooking food has serious limitations. The direct reflector-type cooker gives better performance. The output of reflectors of reasonably small size is large enough to enable cooking not only during the noon hours but also during a large part of the morning and the evening hours.

References

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2. LANGLEY, S. P., *Nature*, (1882), 314.
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Confidential

Private
Investment

From letter 4/29/53 from Fryer.

Conversations are going forward here on the plant for aluminum pipe for irrigation (it is not clear here how the company can expect sales in Saudi to justify the cost of a plant but perhaps they have other unmentioned markets in mind); the possibility of a contract with an agricultural and mechanical college to carry out certain phases of the agricultural work is in the talking stage; a meeting is scheduled for this week on fertilizer from flared gases; we shall probably be ~~able~~ able to pick up Barr, formerly of DMPA, as a consultant on minerals.

E. Industry - Industrial Development

Budget Rewrite 2/4/54

FY-1954

There is little industry save small handicraft shops and consequently most consumer goods and capital goods must be imported. An economic development potential is apparent in the possible growth of industries based on oil and natural gas to produce fertilizers, liquid gas, etc. Also rising local buying power should make it possible to promote the production locally of certain materials and goods such as cement, tiles, and other building materials, etc., and also increase the number of profitable service industries.

Investment of funds by local or foreign capital requires a clearer and more favorable attitude on the part of SAG than demonstrated to date. Local capital has developed the Taif, Mecca and Dammam electric plants.

To date, SAG has done little direct industrial financing though it did help finance a soap factory which is not yet functioning.

RESTRICTED

Excerpt from ~~XXXX~~ Budget Rewrite FY-1954 2/4/53.

Proposed Natural Gas Fertilizer Project

Recruitment of a technician to advise SAG in the use of natural gas and other industrial development problems is being undertaken. At this time it is not known in the field whether this technician will be a regular FCA employee or a contracted person.

FOR JOHN DUNAWAY

*Opportunity
for Investment.*

On the evening of March 14, 1953, I went on an appointment to the office of Suleiman Hamad, Deputy Minister of Finance, and Abdul Aziz bin Abdullah Suleiman, Assistant Deputy of Finance, where we discussed the results of my trip to Dhahran in connection with the proposed expanded ground water development program. I explained that Aramco had made available all their information and that I had several sessions with people in Exploration as well as with Mr. Oliger, Mr. Barger and Mr. Cipher in the Relations Department. I said that I would like to have a few days to prepare a report based on these discussions. I was then asked about Mr. Bogue's trip with Mr. Philby and was read a letter from the Minister of Finance in which he requested a detailed report of the geologic findings during the 66 day trip with Mr. Philby. He asked specifically for the findings on the quantities of the deposit, the analysis of the samples collected and brought to Jidda and especially stressed the vital importance of the possible iron deposits and what we should do as soon as possible to assist in their development. I was then shown an analysis of the samples given to the Mines Department by Mr. Philby in which showed 59% iron and one and a fraction ounces of silver. I expressed the opinion that the quantity of silica was important and that we were sending samples to the United States for determination both of the iron and of the silica. I then expressed the opinion that in view of the favorable quantity of iron in the preliminary analysis that it would be desirable for Mr. Bogue and myself to fly over the area in a C-47 from the Saudi Airlines in order to get some idea of their extent and also in order to mark out the area on the map so that Aero Service Corporation could take aerial photographs and then we would plan to return on the ground and make a somewhat detailed geologic map showing the volume of ore. Suleiman Hamad expressed his agreement to such a program and said that he would send a cable immediately to the Finance Minister requesting that a C-47 be made available and we should stand by to fly up as soon as possible. We then briefly discussed the extent of aerial photography and the difficulty Aero Service were having of cloudy weather. They had consumed about 20,000 gallons of gas, and need an additional supply. Suleiman Hamad then reminded me of his request for a drilling site somewhere in the vicinity of Jidda to be used by a French drilling company to demonstrate a rig they have brought to Jidda in an attempt to interest the Saudi Government. We then briefly discussed the status of the drilling program and I informed him of the presence of some gas in a well drilled for the city water supply at Gizan, adding that a sample would be collected and sent to Dhahran for analysis. I told HE that we were concerned about the way the drilling program was slowing down to which he replied that he would be very happy to have any suggestions I would care to make regarding what is needed to expedite the program.

*(Copying
this file
in future
Reservoir
Mineral
&
water)*

One point in the discussion regarding the ore reserves HE expressed the desire of the Saudi Government to try to interest American companies in the ore if it is sufficiently attractive enough. I replied that the published reports of the Geological Survey are received by all of the mining companies and is one of the best ways to interest American companies in concessions through the medium of Geological Survey Publications. However, I added that our job here is to try to make the Saudi Government strong and economically sufficient and that we are of course very happy to help them interest American mining companies in any substantial ore deposits that they may have.

Glenn Brown

CONFIDENTIAL

7-1
Private
Investm

TECHNICAL COOPERATION ADMINISTRATION
American Embassy
Jidda, Saudi Arabia

April 27, 1953

UNCLASSIFIED

OFFICIAL - INFORMAL

Dear Paul:

I have your note of April 13 with a copy of a letter from the Canlae Corporation indicating an interest in granting a concession for the manufacture of its product. I have no idea what sort of financial arrangements the Corporation has in mind, nor the capital costs involved in erecting a plant. I believe, however, that a less promising field for such an endeavor hardly exists than Saudi Arabia due to the lack of a commercial dairy industry, hence a lack of milk supply for canning purposes. However, if the Corporation cares to furnish the necessary data on costs, I will canvass the situation more thoroughly.

Sincerely,

John A. Dunaway
Acting U. S. Director of
Technical Cooperation in
Saudi Arabia

Mr. Paul F. Taggart, Chief,
Iraq, Jordan and Saudi Arabia Branch, NEADS,
Technical Cooperation Administration,
Department of State,
Washington 25, D. C.

JAD
JADunaway:c

DEPARTMENT OF STATE
WASHINGTON



April 13, 1953

UNCLASSIFIED

OFFICIAL - INFORMAL

Dear John:

Attached for your information is a letter recently received by TCA/W concerning a product now on the market - canned whole fluid milk. You will note also from an observation made in the second paragraph that this company might be interested in considering a franchise arrangement.

Sincerely yours,

Paul F. Taggart

Chief, Iraq, Jordan and Saudi Arabia Branch
Near East and African Development Service
Technical Cooperation Administration

Mr. John Dunaway,
Director of Technical Cooperation,
Care of American Embassy,
Jidda.

CANLAC CORPORATION
508 Pere Marquette Building
New Orleans 12, Louisiana

C
O
P
Y

24th March, 1953

Reply to: Mrs. Baker Barley
Special Representative
Canlac Corporation
3120 N Street, N.W.
Washington, D.C.

Mr. E. F. Gill
Technical Cooperation Administration
U.S. Department of State - Room 403
333 3rd Street, N.W.
Washington, D.C.

Dear Mr. Gill:

Thank you very much for giving me so much of your valuable time today.
It was most enlightening.

Naturally, our primary interest has been the sale of our CANNED WHOLE FLUID MILK which KEEPS WITHOUT REFRIGERATION - however, it is more than possible that we would seriously consider a franchise arrangement in one or more of the countries which you mentioned, particularly Jordan if such an operation were financed by foreign private capital. After you have given this subject matter your most favorable consideration, would you advise me what procedure to follow so that if such a plan is possible, we can take the initial steps to put same into operation.

"STEROLAD" CANNED WHOLE PASTEURIZED, HOMOGENIZED and STERILIZED MILK which KEEPS WITHOUT REFRIGERATION is produced under specifications as issued by the Quartermaster of the U.S. Army and is currently being purchased by all branches of the Armed Forces for use as troop ration issue and for resale in the Commissaries and the Post Exchanges in Europe - North Africa; Tripoli, Libya; Dhahran, Saudi Arabia; Southern Franch; Iceland, etc. An analysis of the milk will be forwarded upon request - as well as samples.

Minimum butterfat is 3.25% - nothing has been added to the milk and nothing taken out of the milk. The milk is canned under vacuum and by our simple process of sterilization, the milk is free of bacteria and thus keeps indefinitely without refrigeration. At the present time, the shelf life of this milk is guaranteed for 6 months - however, we know that this milk has been kept for more than 9 months and was just as fresh as milk which had been canned only 4 to 6 weeks. The milk which was 9 months old was stored in Casablanca, French Morocco.

This canned milk is not an evaporated or a condensed milk - it is fresh milk which has been canned and then sterilized. To be properly served, the milk should be THOROUGHLY CHILLED in the can before opening. This milk should not be diluted - CHILL - OPEN - SERVE.

"STEROLAC" Milk is canned in standard quart tin containers and in 8 ounce cans, packed as follows:

24 quarts (32 oz. net ea.) per carton - 63# gross weight per carton
48 - 8 ounce cans per carton - 34# " " " "
COMMERCIAL PACK - 250# test carton - double steel strapped

PRICES and SAMPLES UPON REQUEST.

I trust the above information will be of help to you and I look forward to hearing from you at your earliest convenience.

Very truly yours,

/s/ B. Barley

B. Barley
Special Representative

From Series Letter #35 dated February 6, 1953, received February 17

*Private
Investment*

"We would be most interested in receiving your comments on Embassy Despatch 216, January 19, Subject: Saudi Firms Seek U. S. Technicians.

"We note that one is the Saudi Tanning and leather works which seeks a complete outlay of modern tanning machinery and other equipment, and that the company also wishes to hire skilled operators and a manager from abroad. We would suggest that Mr. Bode, who has had a number of years experience as a senior officer in American tanning companies, might be of assistance. "

Private Investment

*Letter 6
3/14*

Embassy Despatch No. 216: I have read this despatch and can add very little to it. I have visited the printing plant with the managing director who is also the Director of Agriculture, Sayyid Ahmed Obaid. There is no doubt as to the need of the company for a manager with technical knowledge of all phases of printing, but I am not sure whether the conditions under which he is called on to work will prove satisfactory.

*See also
Suggested
Project - Tanning
& Leather*

The tanning and leather plant is obviously the one I wrote about some time ago in connection with technical advice. It was presented to me as a plant in which the SAG had a substantial interest. This was probably not an attempt to deceive since very few people here can distinguish between the interests of the Government and those of high Government officials, such as Mohammed Suroor.

...

WEEKLY LETTER EXCERPTS

Invest
Comm. &

FOR INFORMATION OF: The files

March 28, 1953

From Series Letter 39, dated March 16, received March 26, 1953

Manufacture

Tannery and leather manufacturing: This would appear to be a

proper technical assistance project in the Commerce and industry field and we will be glad to cooperate on any assistance required. Contracting for personnel service cannot be used to avoid the time required to obtain security clearance. This whole question is the subject of a policy paper which is expected to be issued shortly.

DEPARTMENT OF STATE
WASHINGTON



March 12, 1953

AIR MAIL

UNCLASSIFIED

OFFICIAL INFORMAL

Dear John:

As you know, one of our objectives is interesting American and other capital in investing in underdeveloped countries. In carrying out this objective, our attention has been called repeatedly to the interest of representatives of the business and financial communities in the status, the steps being taken, and the programs planned in certain key areas of the economy. Accordingly, we have developed a simple form which, when executed, not only will enable us to answer these inquiries, but will afford us a basis for future program planning.

While a considerable amount of this information is available in TCA/Washington, it is felt that your execution of the form will greatly increase its objective value. An additional copy is attached for retention in your files.

Sincerely yours,

Paul F. Taggart
Chief, Iraq, Jordan and Saudi Arabia Branch
Near East and African Development Service
Technical Cooperation Administration

Mr. John Dunaway,
Director of Technical Cooperation,
Care of American Embassy,
Jidda.

UNCLASSIFIED

S.A.

Country

March 25, 1953

Date

Check List On Industrial Development

1. Government Stability

Yes

No

Is the Government reasonably stable? ✓

2. Investment Climate

Is there a favorable investment climate?

(See attached "Check-list Investment Climate") ✓

3. Power Sources

Are there sources of power available?

(Fuel or water power) ✓

4. Communications

Does there exist reasonable communications facilities? . .

If not, is this problem recognized and corrective steps being taken? ✓

(Corrective steps daily being made)

5. Transportation

Are there reasonably good transportation facilities? . .

Roads ✓

Railroads ✓

Navigable Rivers ✓

Ports ✓ (2)

Airways ✓ (Fair)

If not, is this problem recognized and corrective steps being taken? ✓

(Except Hoo. Pao. II)

6. Water

Are there adequate sources of fresh water supply? ✓

7. Natural Resources

Are there any natural resources in commercial quantities?

Have there been adequate surveys?

If not, are steps being taken? ✓

(only in parts of SA)

8. Markets

Are markets for these natural resources available?

Has this been determined by adequate market survey? . .

(Except for oil)

9. Man-power

Is there adequate man-power which is capable of absorbing instruction in skills?

Are any vocational institutions established? ✓

(very inadequate)

10. Capital

Does there appear to exist sources of capital either local or foreign?

Is this capital flowing into industrial projects? ✓

(Save in isolated instances)

Check-List "Investment Climate"

Date

Country

1. General

Yes

No

(a) Is the location of the country sufficiently removed from the Soviet orbit to preclude tensions?

Is there comparative freedom from other international tensions?

(b) Is there a substantial middle-class?

(c) Is there freedom from civil unrest?

(d) Is there confidence in the government's policies? . . .
In the government's officials?

(e) Are the government's laws and regulations and information concerning business opportunities conveniently accessible?

(f) Are the investment opportunities in this country significantly better than those offered by other countries?

2. Administrative

✓ (a) Has the Government publicized any statement regarding the role of private enterprise, especially foreign?

✓ (b) Has the Government established any central office responsibility for dealing with prospective foreign investors?

✓ (c) Has the Government assigned any official to its Embassy in the United States to promote interest in investments in the country?

(d) Has the Government analyzed its principal industrial opportunities and developed brochures thereon? . .

✓ (e) Has the Government established a Development Board and given it sufficient authority and funds with which to operate?
Is it operating effectively?

3. Legal

✓ (a) Are Governmental regulations free of restrictions on foreign personnel, both technical and managerial?

- ✓ (b) Are Governmental regulations free of restrictions relative to sites of incorporation and to local participation in ownership of enterprises? ✓
- ✓ (c) Is there equal treatment with respect to property holding and conveying, contract enforcement, right to use local courts for redress, etc.? ✓
- ✓ (d) Have private investors comparative freedom with respect to the nature of the industrial venture? . . . ✓
- ✓ (e) Has a Treaty of Friendship, Commerce and Navigation been signed? ✓
- ✓ (f) Has a guaranty agreement been signed? ✓

4. Finance

- ✓ (a) Is there freedom with respect to the remittance of profits and reinvestment of earnings? ✓
- (b) Are the provisions respecting currency exchange favorable? ✓
- (c) Are there reasonable assurances precluding devaluation, control of capital movements, etc.? ~~✓~~ (same in case of large corporations) ✓
- (d) Has a Development or Industrial Bank been established and placed in effective operations?
If not, is the need recognized and steps being taken to do so? ✓

✓ 5. Taxation

Is substantially similar tax treatment accorded foreign investors? ~~✓~~ ✓

6. General Comment

Very few of the questions can be adequately answered by categorical "yes" or "no" as most of them should be further explained. However, the answers given above are in accord with the best information obtainable.

On the whole the factors are unfavorable except for very large projects which could be covered by special agreements with the Saudi Arabian Government.

TECHNICAL COOPERATION ADMINISTRATION
Jidda, Saudi Arabia

March 26, 1953

UNCLASSIFIED

OFFICIAL INFORMAL

Dear Paul:

I am enclosing the check list on industrial development transmitted in your letter of March 12, 1953. I regret that the answers given present such a gloomy picture but they reflect the situation as I see it.

While the factors favoring investment are almost wholly lacking, the picture is somewhat different in the case of large scale enterprises such as exploitation of newly discovered iron ore deposits and manufacture of fertilizers from natural gas. Such ventures would naturally be undertaken only by agreement with the Saudi Arabian Government in which the investor protects himself from some of the most obvious hazards. There may also be opportunities for American contractors in railway and other construction. It is too early to regard any of these projects as business opportunities as more data must be secured before they would be of interest to American investors.

As for the attitude of the Saudi Arabian Government toward ordinary business ventures, please see FS Despatch No. 173 of December 18, 1952, (U.S. Embassy, Jidda). I am enclosing three extracts from this despatch.

We shall try to keep you informed on business opportunities and I have been designated personally to handle this part of the work.

Sincerely,

John A. Dunaway
Acting U. S. Director of Technical
Cooperation in Saudi Arabia

Mr. Paul F. Taggart,
Chief, Iraq, Jordan and Saudi Arabia Branch
Near East and African Development Service
Technical Cooperation Administration,
Department of State
Washington, D. C.

UNCLASSIFIED

F. S. Dispatch # 173 D 18, 1952

Am Emb to Dept of State

Subject: The New Residence Regulations of S. A.

BRIEF SUMMARY - RESIDENCE REGULATIONS

ROYAL DECREE 17/2/25/1337/ 4 June, 1952.

Article 5-D

1. As with existing Saudi Visa Regulations which with few exceptions prevent any Saudi Arabian Diplomatic Mission from issuing a visa unless previously approved by the Foreign Office or Riyadh, the residence regulations are very restrictive and do not encourage foreign entry. A local guarantor is required and close supervision of foreigners established. All undesirable from the standpoint of religion, morality, politics, are excluded.

Article 45 # 1 - 3

2. If a foreigner wishes to invest funds or start a business, he must have a minimum of 100,000 SR in cash or draft in his name in one of the banks in Saudi Arabia. He cannot enter business except in partnership with a Saudi Arabian who shall have at least 51% of the capital - Saudi partner shall receive not less than 51% of the profits.

Article 45 # 4

3. The Saudis employed by such a firm shall not be less than $\frac{3}{4}$ the number of the foreigners employed, either of his nationality or other nationalities whose proficiencies are shared by none of the nationals. The total wages paid to Saudis employed in his works shall also not be less than $\frac{3}{4}$ of the total wages paid to others.

Dear Paul:

I am enclosing the check list on industrial development transmitted in your letter of March 12, 1953. I regret that the answers given present such a gloomy picture but they reflect the situation as I see it.

While the factors favoring investment are almost wholly lacking, the picture is somewhat different in the case of large scale enterprises such as exploitation of newly discovered iron ore deposits and manufacture of fertilizers from natural gas. Such ventures would naturally be undertaken only by agreement with SAG in which the investor protects himself from some of the most obvious hazards. There may also be opportunities for American contractors in railway and other construction. It is too early to regard any of these projects as business opportunities as more data must be secured before they would be of interest to American investors.

As for the attitude of SAG toward ordinary business ventures, please see FS Despatch No. 173 of December 18, 1952, (U.S. Embassy, Jidda).
I am inclosing three brief extracts from this despatch.

We shall try to keep the ^{you} ~~Department~~ informed on business opportunities and I have been designated personally to handle this phase of the work.

Sincerely,

John A. Dunaway

6. Very few of the questions can be adequately answered by categorical "yes" or "no" as most of them should be further explained. However, the answers given above are in accord with the best information obtainable.

On the whole the factors are unfavorable except for very large projects which could be covered by special agreements with SAG.

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UNCLASSIFIED

CIRCULAR AIRGRAM

Control 2292
October 23, 1952
8:50 a.m.
(recd AmEmbassy Jidda
Nov.2, 1952)

PRIVATE INVESTMENT PROGRAM IN TCA COUNTRIES

To Certain American Diplomatic Officers

1. It has become increasingly clear that the success of our Point 4 efforts in underdeveloped countries depends in large measure upon increased investments of private capital from the U. S., other capital exporting countries, and from local sources. There is agreement in the Executive Branch that a considerable part of our total effort in the Point 4 program must be directed to this end. The investment of private funds from capital exporting countries, particularly from U. S., has the added advantage in most cases of providing managerial and technical know-how to industrial development and will favorably affect the world dollar situation.

The Congress has recently reemphasized its interest in efforts to make wider use of private enterprise in the foreign assistance program, and DMS has asked all agencies concerned to cooperate in an intensified program. TCA and the Department of Commerce will pool their resources to carry out a joint program.

This circular airgram should of course be read in the light of activities already underway in your area, as well as in the light of local political conditions.

2. It is agreed that in the beginning this intensified program will consist, in the main, of the following three principal parts:

(a) The encouragement of conditions favorable to private investment, both local and foreign.

(b) The identification of specific opportunities for investment, and location of interested investors.

(c) The assembly and dissemination of country background information necessary to foreign investors.

The various phases of the program must of course be integrated, and the closest collaboration will be required among the Missions, including the Point 4 staff, the Department of State, including TCA/W, and the Department of Commerce, and its Field Offices.

October 23, 1952
8:50 a.m.

Opportunities for investment abroad must be presented to private businessmen, both local and foreign, in the most specific terms possible. The assembly of background information on a country by country basis will provide potential U. S. investors with competent and reliable data as to the conditions and circumstances under which a private enterprise can be established and conducted. This information is also useful in efforts to develop a more favorable atmosphere for private enterprise, and will help in negotiations with the host country on specific restrictions which adversely affect the investment of domestic and foreign private capital, and in negotiation of international agreements, such as Treaties of Friendship, Commerce and Development, investment guaranty agreements, and tax treaties.

3. In the field the Mission, working with the host government, local business groups and individual businessmen, will be responsible for identifying and developing specific information on opportunities for investment, assisting in supplying background information, and in carrying out negotiations with the host government in an attempt to make the investment climate more attractive. To carry out this program, it is suggested that all officials of the Mission, including Point 4 staffs, should be instructed to keep in mind constantly the desirability of encouraging private participation in developmental activities of all kinds.

The economic section of the Mission should intensify the work it has regularly carried on in this field. In addition, the Country Director for Technical Cooperation should appoint a member of his staff who will be responsible for the private investment phase of the Point 4 activities (ordinarily this will be the Industrial Advisor where there is such a position; where there is a definite and active interest on the part of the country, it may prove desirable to appoint a special assistant or adviser for this purpose). It is intended that the work of the Point 4 staff in this field should supplement the work of the economic section, but not supplant or duplicate it. It will be the responsibility of the Mission Chief to work out means of coordinating the Mission's total activities in this field.

In compliance with Foreign Service Economic Reporting Circular No. 31 of July 20, 1951, the Economic Section of the Mission, with the assistance of the Point 4 staff, should report the necessary details of specific opportunities for private U. S. investment. The cooperation

of

October 23, 1952.
8:50 a.m.

of local private business groups should be solicited for the collection and exchange of information about investment opportunities. Assistance can and should be provided to officials and local businessmen in the development of effective methods for presenting investment opportunities.

Emphasis should be placed upon reporting all background information which would be valuable to U. S. Agencies in Washington and to private businessmen in connection with the investment program. The Point 4 staff should contribute to and supplement regular Foreign Service reporting with special reports covering specific items or factors affecting private investment which come to their attention in the course of their regular activities. Value of information concerning positive achievements of foreign private enterprise for dissemination in other areas should be kept in mind.

All means of furthering private enterprise through jointly agreed technical assistance projects should be explored. Of particular long-range importance are projects designed to facilitate private investment through advice in such fields as government fiscal policies and administration, tax laws, mining and corporation laws, etc., and through advice and possibly joint action with respect to improvement of credit facilities and establishment and strengthening of institutions directed at channeling private capital into approved development enterprises.

Special consideration must be given to the encouragement of private capital to undertake economic development where feasible and to discourage the use of public funds, particularly U. S. public funds, in areas where private capital can possibly be induced to undertake the development.

The Mission may find it possible to work with the foreign government in creating interest in increasing private investment, foreign and local, directing attention to the benefits, both social and economic, which private enterprise has brought to other areas and pointing up ways in which private enterprise could further national policy on terms consistent with the government's objectives.

4. In Washington TCA/W and the OIT in the Department of Commerce will be responsible for making information supplied from the foreign Missions available to interested business concerns, will assemble and disseminate background information regarding conditions and circumstances

for

October 23, 1952

8:50 a.m.

-4-

for investment in specific countries, and will assist in preparing for treaty and other types of negotiations in the interest of improving the investment climate. In certain cases Washington staff members may be made available for temporary work with country Missions in developing background information and other aspects of the program.

Specific information on investment opportunities and general background information will be made available to the American business community by a variety of means. The 43 Department of Commerce field offices provide a useful facility for this purpose. The various publications of the Department of Commerce and other means of communication will be fully utilized. It is intended also to arrange investment clinics and investment institutes on particular countries or regions and to carry on a substantial program of private consultation and counseling. This last is to be employed extensively not only in connection with investment opportunities reported from abroad, but also in connection with requests originating from U.S. businessmen for advice and assistance in establishing business abroad.

5. Plans are being made to send a small team of highly qualified experts composed of Government and private business representatives to two or three countries where it appears most feasible to especially emphasize the investment program to assist the Mission in developing such a program.

Consideration has also been given to the possibility of contracting with private U. S. Firms of consulting engineers or industrial research development institutes to assist the host Government in the identification and analysis of specific investment opportunities and the preparation of brochures suitable for serious consideration by private investors. Such private agencies might also, in a normal business fashion, bring this material to the attention of businessmen and firms likely to be interested.

6. The Department is of course aware of the delicacy of this subject in many countries. Every effort must be made to avoid giving impression that we are seeking to force United States capital on unwilling customers. We are certainly not, nor will we be, interested in doing this. On the other hand, forward steps in this field must not be suspended simply for fear of attacks from pro-Communists, et cetera. In considering steps to be taken, you should bear in mind that the Congress regards this phase of the Point 4 program as of equal importance with the governmental assistance phase. The possibility that no substantial success will be achieved along these lines in particular country is not regarded as a sufficient reason for taking no action.

7. Comments by the Missions on the general aspects of this proposal and on the feasibility of either suggestion in paragraph 5 are urgently requested, including an outline of plans for carrying out these activities and suggestions for the improvement of this proposed joint program.

BRUCE (Acting)

Private Investment

SecState

February 26, 1953

WIROM

UNCLASSIFIED

NOSEC

TOTEC

re Circular Telegram 880. Dunaway assigned responsibility investment phase TCA. No significant development since Embassy report on circular airgram control 2292 October 23.

HARE

JADunaway/1 2/26/53

From: SecState Washington

Feb. 18, 1953

Circular 880

UNCLASSIFIED

Received 2/19/53

TOTEC

Progress report implementation intensified private investment program accordance circular Airgram Control 2292, October 23, urgently required for adequate report to congressional committees on TCA activities this area. Specific reference Section 3 indicate member TCA staff assigned responsibility investment phase Point Four.

DULLES

ga

American Embassy
Jidda, Saudi Arabia
March 5, 1953.

Mr. Thomas P. Collier
Manager, International Division
Armour Research Foundation
Illinois Institute of Technology
Technology Center
Chicago 16, Illinois

Dear Mr. Collier:

I have your letter of February 11 in regard to the activities of the Foundation which might be of interest to our work in Saudi Arabia.

There are several fields in which industrial research might be undertaken but the arrangements will be made by the Washington office of the Technical Cooperation Administration. One important project now being considered is the utilization of natural gas in manufacture of fertilizer and possibly other by-products. We may also need the aid of technicians in studying a tanning and leather manufacturing plant.

I am Referring your letter to Mr. E. Reeseman Fryer, Assistant Administrator, NEADS, TCA Washington, for consideration.

Very truly yours,

John A. Dunaway
Acting U. S. Director of
Technical Cooperation in
Saudi Arabia

cc: Mr. E. Reeseman Fryer

File
D

Jidda, Saudi Arabia

February 16, 1953

Dr. William D. Johnston
Chief, Foreign Geology Branch
U. S. Geological Survey
Washington 25, D. C.

Dear Bill:

I have been approached thru Mr. John Dunaway, TCA Country Director, by one, Abdul Samad Najib, who wishes to start a salt-evaporation business here at Jidda. He states that currently salt is imported at the rate of one kilogram for 1 riyal (28 ¢) from England. Bedu evaporate crude salt all along the Red Sea coast for local use, and apparently the heat and long hours of sunshine make the process feasible.

Therefore, could you ask someone to get any information available on the process, either at Department of Commerce or Bureau of Mines or perhaps people who manufacture the equipment. He plans 100 pits each 4x5 meters square and 8 cm deep in the initial venture. I have suggested the desirability of making evaporation rate test on the shore of the sea and some distance inland where the humidity drops rapidly in order to find the place with greatest yield.

Sincerely,

Glen F. Brown

cc. to: Mr. John Dunaway ✓

I O N I C S
Incorporated

152 Sixth Street
Cambridge 42 Massachusetts

Sea Water Desalting

Extract from letter of March 19, 1952, from E.R. Gilliland, President of Ionics, Incorporated, to Arthur N. Young.

This development was carried out at Ionics, Inc. a small research and development organization here in Cambridge, which is largely owned by American Research and Development Corporation. I have served as president of Ionics since it was formed, but the actual research and development activity of the organization has been handled largely by Dr. Walter Juda, Vice President and Technical Director.

Ionics has developed a new method for desalting solutions such as sea water, molasses, milk, etc. It operates on the basis of utilizing electrical energy to remove the ionized salts from the solution. We have operated small laboratory type units for several months. These produce a few gallons of purified water per hour from sea water. At the present time we are beginning work on a unit with a capacity of a few hundred gallons per hour. The present units are essentially handmade and the cost is almost completely the labor required. The electrical energy consumption for the small units has been accurately determined: this should be the same for a larger installation. It is possible to use an energy consumption as low as 20 k.w.h. per 1000 gallons of purified water produced, but preliminary studies would indicate that a power consumption of 50 to 100 k.w.h. per 1000 gallons of purified water would probably be more economical, because this would allow the first cost of the unit to be reduced. The optimum design depends upon cost of electrical energy and the cost of building the unit. We have made estimates of the cost of building large size units in large numbers and believe that with electrical energy at 0.3¢ per k.w.h. it should be possible to produce purified water from sea water at a total cost of around 20¢ per 1000 gallons. However, the values used for the cost of the equipment are only estimates at the present time. Incidentally, these figures are based upon desalting normal sea water, which contains around 30,000 parts of salt per million parts of water. It is my understanding that the water in the Persian Gulf contains almost twice this amount of salt. If this is the case, it would about double the energy required per 1000 gallons. We have talked to several of the large oil companies operating in the Middle East and it is our conclusion that it would be preferable to treat some of the brackish water available in that area rather than the sea water.

This new process is in its initial development period and it is my estimate that it will be several years before Ionics is in a position to engineer and build units of the size required for municipal and agricultural purposes.

Da Stan

March 1, 1952
Jidda, Saudi Arabia

Dr. Karl T. Compton
Massachusetts Institute of Technology
Boston, Massachusetts

Dear Karl:

The New York Times of February 21 contains an article by William L. Laurence concerning the de-salting of sea water. This article indicates that the process is being developed at M.I.T. and indicates that you are familiar with the work.

I am in Saudi Arabia as head of a financial mission, and also, at Washington's request, I am temporarily taking charge of the Point 4 program here pending the arrival of President Stratton of Middlebury College, who is to take over from me.

Obviously the de-salting of sea water could be of utmost importance to this country. The press report indicates that cheap power is a prerequisite. Saudi Arabia has enormous quantities of natural gas which is now being burned as waste. Presumably the gas would be a suitable source of power for the east coast. For the Red Sea area, however, which is nearly one thousand miles away from the gas, it would be necessary to transport oil by sea. The cost per barrel would be about \$1.70 per barrel. Presumably the quantity that might be used would not justify a pipe line.

Obviously, Saudi Arabia ought to investigate carefully the feasibility of the new process. I shall be most grateful if you will arrange for me to receive such information bearing on the problem here as may be available. Also, I should like your advice as to what specific steps it would be advisable to take with a view to exploring the applicability of the new process to the problems here.

Nellie Ma joins in sending greetings and good wishes to you and your family.

Copies to: American Embassy, Jidda
Dr. Thomas A. Hart,
TCA, Washington

Sincerely yours,

Arthur N. Young
Financial Advisor to the
Kingdom of Saudi Arabia